

## A NEW SPECIES OF THE GENUS *PEDETONTINUS* (MICROCORYPHIA, MACHILIDAE) FROM CHINA

CHENG Hong-Yi, YU Dan-Na, ZHANG Jia-Yong\*

Institute of Ecology, College of Chemistry and Life Science, Zhejiang Normal University, Jinhua 321004, China

**Abstract** A new species of *Pedetontinus* (Insecta, Microcoryphia) from Mt. Funiu, Luanchuan City, Henan Province, China, *Pedetontinus luanchuanensis* sp. nov. is described and illustrated. It is closely related to *P. songi*, but differs in the number of setae of maxillary palp and legs, the body length and ratio of basal part to terminal part of penis. A key to the species of *Pedetontinus* is provided.

**Key words** Archaeognatha, Microcoryphia, Machilidae, *Pedetontinus*, new species, China.

### 1 Introduction

The genus *Pedetontinus* Silvestri can be easily recognized by the following characters: scales absent from antennal flagellum, 1 + 1 eversible vesicles present on abdominal segments I – VII, paired ocelli shoe-shaped, distal area of mandibula provided with four well developed apical teeth, male genitalia completely covered by the urosternite IX. Twelve species of the genus *Pedetontinus* Silvestri have been cited from China, Japan and Korea (Silvestri, 1943; Mendes, 1990a; Xue and Yin, 1991; Choe and Lee, 2001a, b; Zhang *et al.*, 2005; Zhang and Li, 2009). Those species can be divided into three group, viz: “wide-eyed group” (*P. aureus* Choe and Lee, *P. lineatus* Choe and Lee, *P. rhombus* Choe and Lee, *P. songi* Zhang and Li, *P. tianmuensis* Xue and Yin, *P. yinae* Zhang *et al.*), “long-eyed group” (*P. szeptyckii* Mendes) and “long-equal-wide-eyed group” (*P. ishii* Silvestri, *P. dirocerus* Silvestri, *P. kuvanae* Silvestri, *P. esakii* Silvestri and *P. yosii* Silvestri). To date, there are 20 species found in China (Yu *et al.*, 2010). While examining the specimens of bristletails collected from Henan Province China, one species of genus *Pedetontinus* was identified as new to science and described in present paper. An updated key to the world species of the genus *Pedetontinus* is also presented.

### 2 Materials and Methods

The specimens are deposited in the College of Chemistry and Life Science, Zhejiang Normal University, China. The morphological terminology follows that of Mendes (1990b). The measurements in the paper are in millimeters (mm).

### 3 Description

#### Machilidae Grassi, 1888

#### Petrobiinae Paclt, 1970

#### *Pedetontinus luanchuanensis* sp. nov. (Figs 1–28)

Holotype ♂ (No. ZJNUSB040), under basalt rock covered with lichen or liane of Mt. Funiu (33°42' N, 111°45' E; alt. 1 045 m), Luanchuan, Henan Province, China, 15 Aug. 2010, collected by ZHANG Jia-Yong and LI Tao. Paratypes: 4 ♂♂ (No. ZJNUSB041–044), 5 ♀♀ (No. ZJNUSB045–049), same data as for holotype.

Males. Body length 8.5 – 12.0 mm ( $n = 5$ ); antennae 4.5 – 6.5 mm; terminal filament 8.0 – 9.8 mm; cerci 3.0 – 3.8 mm. Body brownish grey, covered densely with scales and with pigments. Terga mostly covered with brown scales. Black spots present on side of terga VII. Epidermic pigment on head capsule, labium, labial palp, mandibles, maxillae, maxillary palp, legs, penis and parameres.

Head brown between antennae, clypeus and labrum (Fig. 1). Clypeus and labrum covered with numerous short, thin setae. Frons convex moderately, with four long setae.

Compound eyes large and black-brownish, with a small yellowish patch on inner corner (Fig. 2), ratio of contact line to length (cl/l) as 0.48; ratio of length to width (l/w) as 0.84. Paired ocelli shoe-shaped, enlarged in submedian area, black-brownish (in alcohol).

Antennae shorter than body, ratio of antennae length to body length about 0.40 – 0.55. Scapus and pedicellus of antennae densely scaled, flagellum not scaled. Scapus rather long (ratio of length to width about 2.0); pedicellus length equal to width (Fig. 3). Flagellum uniformly brownish, junctions between

This project was supported by the National Natural Science Foundation of China Project (NSFC) (31000966); Key Disciplinary Construction of Zhejiang Province in Ecology; the Open Fund of Jiangsu Key Laboratory for Biodiversity and Biotechnology, College of Life Sciences of Nanjing Normal University and the Scientific Fund of Education Department of Zhejiang Province (Y200909177).

\* Corresponding author, E-mail: zhang3599533@163.com

Received 30 Nov. 2010, accepted 27 Dec. 2010.

segments light-grey. Maximum divisions of flagellum maximum observed as 24 – 25, proximal 8 divisions not annulated, divisions 9 – 15 annulated into 2 – 5 annuli, divisions 16 with 8 annuli, 17 – 25 with 9 annuli. The distal chains with 9 annuli, each one about 2 times long as wide (Fig. 4).

Mandibles quite robust, with four typical apical teeth. Maxillary palp with numerous setae of moderate size (Fig. 5). External apophysis of article I cone-shaped and slightly curved backwards with setae sparsely on ventral surface. Article II with dense short setae on ventral surface, not extending beyond article III. Article III with dense short setae on ventral surface and few setae on internal distal end, article V – VII with dense setae; article VII cone-shaped. Dorsal surface of the articles V – VII with hyaline spines V as 4 – 6, VI as 12 – 16, VII as 10 – 12. Length ratio of article VII/VI as 0.63, IV/V as 0.80.

Labial palp as show in Fig. 6, article not scaled, articles I – III sparsely scaled and with dense setae; article III almost club like, with sensorial cones on ventral apical part.

Legs and coxal stylets scaled (Figs 7 – 9). Mid and hind legs with coxal stylets. Femur of fore leg not swollen, ratio of length to width as 2.0. Spines present on femur, light-colored. Length of tibia I as 0.50 – 0.55 mm, tibia II as 0.50 – 0.55 mm, tibia III as 0.79 – 0.80 mm. Fore legs stronger than others, tibia of hind legs elongated.

Urosternites not pigmented. Abdominal stylets not especially elongated except segment IX. Abdominal segments I – VII with a pair of eversible vesicles. Sternum V with nearly right posterior angle ( $87^{\circ}$  –  $89^{\circ}$ ); ratio of length to basal width of sternum V as 0.64 – 0.65 (Fig. 10). Urosternite VII without swollen on its inner posterior part (Fig. 11).

Penis and parameres with 1 + 5 divisions (or 6 divisions) extending backward to 2/3 of length of the urosternite IX (Figs 12 – 13). Penis as long as paramere, ratio of basal part to terminal part as 3.0 – 3.2, opening of penis small and apical. Male genitalia completely covered by urosternite IX. Apical spine of abdominal stylets strong, medium-sized. Coxite IX with 2 – 5 spines near apex. Length ratios of stylet (excluding apical spine) to coxite V as 0.47, VIII as 0.47, IX as 0.63. Length ratios of apical spine to stylet V as 0.39, VIII as 0.31, IX as 0.37.

Terminal filament and cerci with numerous scales and setae, but without piliform scales.

Females. Body length 11.0 – 11.5 mm ( $n=5$ ), antennae 4.5 – 4.7 mm, terminal filament 8.8 – 9.0 mm, cerci 3.3 – 3.5 mm. Scale pattern and epidermic pigment as in male.

Head as in male (Fig. 14), with more setae present in the labrum and the clypeus than in male.

Compound eyes as in male (Fig. 15), ratio of contact line to length (cl/l) as 0.43, ratio of length to width (l/w) as 0.87 – 0.88. Paired ocelli shoe-shaped, red brownish (in alcohol), the width of ocellus slightly narrower than that of compound eye (ocellus about 0.75 times wide as compound eye).

Antennae as in male. Length ratio of antennae length to body as 0.39 – 0.41. Scapus rather long (ratio of length to width about 2.00) (Fig. 16). Maximum divisions of flagellum maximum observed as 23. Proximal 6 divisions not annulated, divisions 7 – 13 annulated into 2 – 4 annuli, divisions 14 – 23 with 6 – 7 annuli. The distal chains with 6 annuli, length of annuli subequal to width (Fig. 17).

Maxillary palp as in male (Fig. 18). Articles II – VII densely scaled. Article I only scaled on ventral surface, V – VII with dense setae and VII cone-shaped. Dorsal surface of articles V – VII with hyaline spines V as 1 – 3, VI as 14, VII as 11 – 12. Length ratio of article VII/V as 0.6, IV/V as 0.66 – 0.68.

Labial palp as in male (Fig. 19).

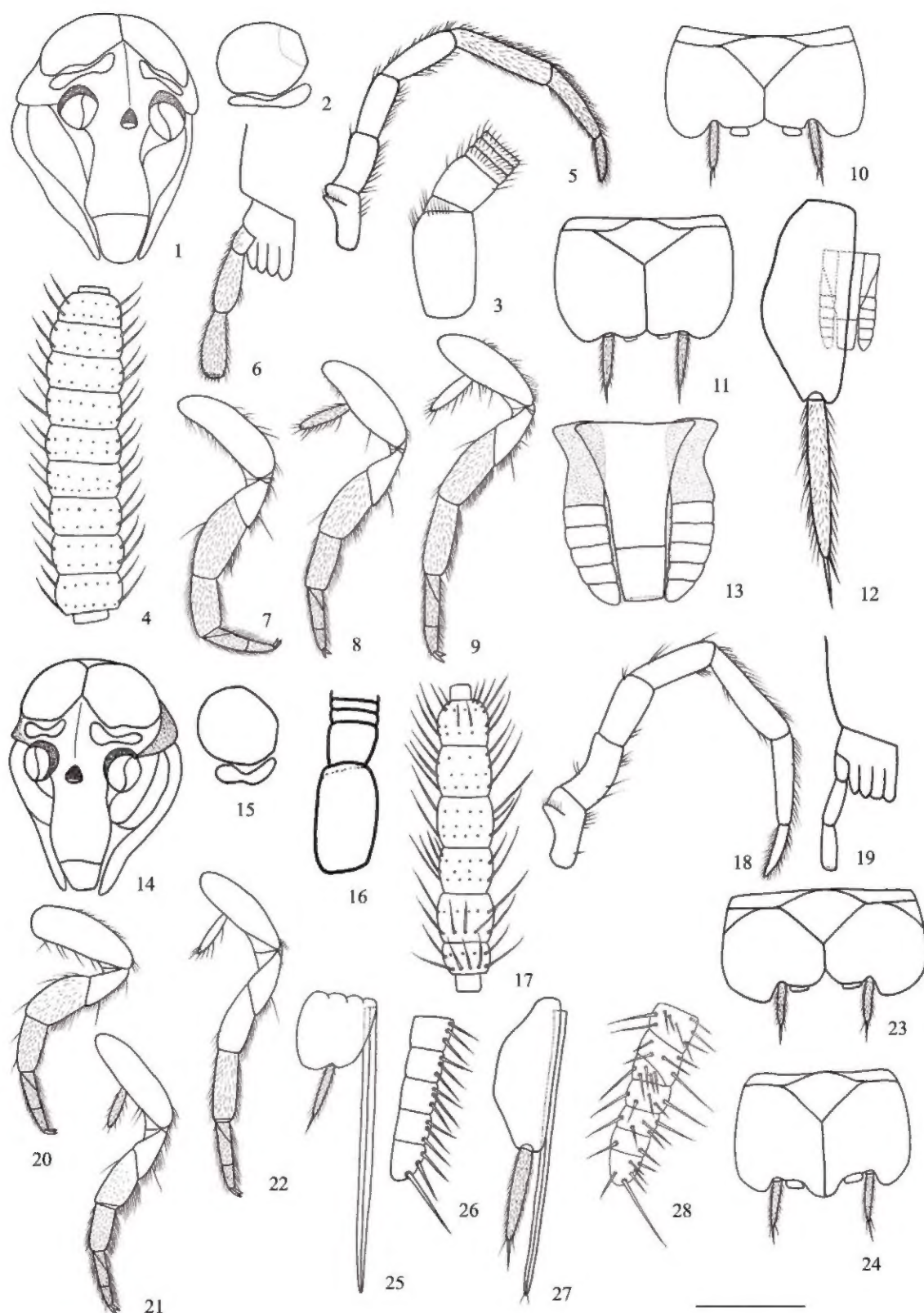
Legs as in male (Figs 20 – 22). Femur of fore leg not swollen, ratio of length to width as 1.80. Spines present on femur, light-colored. Length of tibia I as 0.50 – 0.55 mm, tibia II 0.48 – 0.50 mm, tibia III 0.69 – 0.70 mm. Fore leg stronger than others, tibia of hind leg obviously elongated.

Abdominal segments as in male. Ratio of Length to basal width of sternum V as 0.66 – 0.67 (Fig. 23). Medial part of urosternite VII projected and swollen, exceeding posterior margin (Fig. 24).

Ovipositor robust, with tertiary type and exceeding beyond the stylet of urosternite IX. Gonapophysis VIII with 46 divisions, sensilla present except 2 – 3 basal divisions (Figs 25 – 26). Gonapophysis IX with 42 – 43 divisions, the basal 25 – 26 divisions with some short setae (Figs 27 – 28). Coxite IX with 3 – 5 spines near apex. Length ratios of stylet (excluding apical spine) to coxite V as 0.50 – 0.52, VIII as 0.60 – 0.62, IX as 0.60 – 0.62. Length ratios of apical spine to stylet V as 0.48 – 0.50, VIII as 0.42 – 0.44, IX as 0.25 – 0.28.

Terminal filaments and cerci similar to those of male.

Diagnosis. *P. luanchuanensis* sp. nov. belongs to “wide-eyed group”, with parameres of 1 + 5 divisions, penis and paramere extending backward to 2/3 length of coxite IX, ratio of basal part to terminal part of penis 3.0 – 3.2, boundary line between oculi slightly shorter than 2/3 length of ocular. *P. luanchuanensis* sp. nov. is most closely related to *P. songi*, but differs in the body length, length ratio of abdominal styli to coxite, and ratio of basal part to terminal part of penis. The new species are easily distinguished from other known *Pedetontinus* species in



Figs 1–28. *Pedetontinus luanchuanensis* sp. nov. 1–13. Male. 1. Head, frontal view. 2. Oculus and ocellus. 3. Part of antenna. 4. The distal chains of antenna. 5. Maxillary palp. 6. Labium and labial palp. 7. Fore leg. 8. Mid leg. 9. Hind leg. 10. Urosternite V. 11. Urosternite VII. 12. Urosternite IX with parameres and penis. 13. Parameres and penis. 14–28. Female. 14. Head, frontal view. 15. Oculus and ocellus. 16. Part of antenna. 17. The distal chains of antenna. 18. Maxillary palp. 19. Labium and labial palp. 20. Fore leg. 21. Mid leg. 22. Hind leg. 23. Urosternite V. 24. Urosternite VII. 25. Urosternite VIII with anterior gonapophyses. 26. Distal parts of anterior gonapophyses. 27. Urosternite IX with posterior gonapophyses. 28. Distal parts of posterior gonapophyses.



China and its vicinities as following: the pigmentation of whole body, color pattern, ratio of length to width of eyes, the number of setae of maxillary palp and legs.

**Etymology.** The specific name refers to the type locality Luanchuan City.

**Distribution.** China (Henan Province).

#### Key to species of *Pedetontinus*.

1. Oculi normal, length as long as width, or length longer than width ..... 2  
     Oculi width longer than length ..... 7
2. Oculi length longer than width, legs with hyaline spines, transparent spiniform seta in legs, Penis shorter than paramere ... *P. szeptyckii*  
     Oculi length as long as width ..... 3
3. Boundary line between oculi as long as, or longer than 2/3 length of ocular ..... 4  
     Boundary line between oculi shorter than 2/3 length of ocular ... 6
4. Ratio of length to basal width of urosternite V greater than 2/3 a pair of paramere with 1 + 7 articles ..... *P. ishii*  
     Ratio of length to basal width of urosternite V less than 2/3 ..... 5
5. Ratio of length to basal width of urosternite V about 3/8, the terminal segments of flagellum with 6 or 7 annuli ... *P. dicrocenus*  
     Ratio of length to basal width of urosternite V about 1/4, the terminal segments of flagellum with 7 or 8 annuli in female, 9 annuli in male ..... *P. kuvanae*
6. Ratio of length to basal width of urosternite V about 1/3, the terminal segments of flagellum with 6 or 7 annuli in female, 9 or 10 annuli in male ..... *P. esakii*  
     Ratio of length to basal width of urosternite V about 1/4, the terminal segments of flagellum with 7 or 8 annuli in female, 9 annuli in male ..... *P. yosui*
7. Boundary line between oculi as long as, or longer than 2/3 length of ocular ..... 8  
     Boundary line between oculi slightly shorter than 2/3 length of ocular ..... 12
8. Boundary line between oculi as long as 2/3 of ocular length, penis slightly longer than paramere and extending backward to 2/3 length of coxite IX ..... *P. aureus*  
     Boundary line between oculi longer than 2/3 length of ocular ..... 9
9. Paramere with 1 + 6 articles ..... 10  
     Paramere with 1 + 5 articles ..... 11
10. Body length about 11 – 14 mm, gonapophyses with 51–58 divisions, color of antenna uniformity ..... *P. rhombeus*  
     Body length about 7 – 8 mm, gonapophyses with 41 – 45 divisions, proximal half of flagellum whitish in color, others uniformity ..... *P. yinae*

11. The ratio of length to basal width of urosternite V less than 1/2, terga with a pair of prominent median black scales ... *P. lineatus*  
     The ratio of length to basal width of urosternite V about 2/3, terga without prominent median black scales ..... *P. songi*
12. Paramere with 1 + 6 articles, penis and paramere extending backward to 3/4 length of the coxite IX ..... *P. tianmuensis*  
     Paramere with 1 + 5 articles, penis and paramere extending backward to 2/3 length of coxite IX ..... *P. luanchuanensis* sp. nov.

**Acknowledgements** We are grateful to the Administrative Bureau of Funiushan Mountain National Nature Reserve in Longyuwan for collecting specimen.

#### REFERENCES

- Choe, G-H and Lee, B. S. 2001a. A new species of the genus *Pedetontinus* (Archaeognatha, Machilidae) from Korea. *Korean J. Bio. Sci.*, 5: 113–116.
- Choe, G-H and Lee, B. S. 2001b. Two new species of the genus *Pedetontinus* (Archaeognatha, Machilidae) from Korea. *Korean J. Bio. Sci.*, 5: 179–185.
- Mendes, L. F. 1990a. On a new species of *Pedetontinus* Silvestri, 1943 (Microcoryphia: Machilidae) from Northern Korea. *Garcia de Orta, sér. Zoologia*, 17: 53–58.
- Mendes, L. F. 1990b. An annotated list of generic and species names of Machilidae (Microcoryphia, Insecta) with identification keys for the genera and geographical notes. *Estudos. Ensaios e Documentos*, 1–127.
- Silvestri, F. 1943. Contributo alla conoscenza dei Machilidae (Insecta, Thysanura) del Giappone. *Boll. Lab. Zool. Gen. Agr. Portici*, 32: 283–306.
- Sturm, H. and Machida, R. 2001. Handbook of Zoology. Band 4. Arthropoda; Insecta; Teilband/ Part 37. 37: 1–213.
- Xue, L-Z and Yin, W-Y 1991. Two new species of Machilidae from the Tianmu Mountain, China (Microcoryphia). *Contr. Shanghai Inst. Entomol.*, 10: 77–86.
- Zhang, J-Y, Song, D-X and Zhou, K-Y 2005. A new species of the genus *Pedetontinus* (Microcoryphia, Machilidae) from China. *Acta Zootax. Sinica*, 30: 549–554. [动物分类学报]
- Zhang, J-Y and Li, T 2009. A new bristletail species of the genus *Pedetontinus* (Microcoryphia, Machilidae) from China. *Acta Zootax. Sinica*, 34: 203–206. [动物分类学报]
- Yu, D-N, Zhang, W-W and Zhang, J-Y 2010. Two new species of the genus *Pedetontinus* (Microcoryphia, Machilidae) from China. *Acta Zootax. Sinica*, 35: 444–450. [动物分类学报]

## 中国跃蛎属 (石蛎目, 石蛎科) 一新种记述

程宏毅 俞丹娜 张加勇\*

浙江师范大学生化学院生态研究所 浙江金华 321004

**摘要** 记述采自河南栾川龙浴湾跃蛎属 1 新种, 即 *Pedetontinus luanchuanensis* sp. nov. 并修订跃蛎属已知种的检索表。

栾川跃蛎, 新种 *Pedetontinus luanchuanensis* sp. nov. (图 1 ~ 28)

体长 8.5 ~ 12.0 mm, 复眼长/宽为 0.84 ~ 0.88, 中连线/长为 0.43 ~ 0.48, 复眼中缘具浅黄色色斑, 阳基侧突为 1 + 5 型, 阳茎基节/端节为 3.0 ~ 3.2, 阳茎和阳基侧突位于第 IX

**关键词** 石蛎目, 石蛎科, 跃蛎属, 新种, 中国。

中图分类号 Q969.121

肢基片的 2/3。

新种与宋氏跃蛎 *P. songi* Zhang & Li 相似, 但复眼中连线/长、阳茎基节/端节具明显区别 (宋氏跃蛎复眼中连线/长为 0.72, 宋氏跃蛎 *P. songi* 阳茎基节/端节为 2.0)。

正模 ♂, 编号 ZJNUSB040, 河南栾川龙浴湾, 海拔 1 045 m, 2010-08-15, 张加勇、李涛采。

词源: 新种以采集地所在的市命名。

\* 通讯作者, E-mail: zhang3599533@163.com